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REQUEST FOR INFORMATION (RFI) **CRYOGENIC PIPING SPOOL SECTIONS**

Introduction

National Aeronautics and Space Administration (NASA) invites potential offerors to submit a response to this RFI to find interested and qualified sources as well as budgetary and schedule planning information for the validation of preliminary design, fabrication, and acceptance testing of Low Pressure Liquid (LH2 & LO2) Cryogenic Vacuum Jacketed Piping spool sections and optional High Pressure Gaseous Cryogenic Helium Vacuum Jacketed Piping spool sections. These cryogenic piping spools will be delivered to KSC for later installation by another separate installation contractor (TBD) in the Mobile Launcher for use in the Constellation Program. This piping will become installed permanent Ground Support system for transfer of cryogenic fluids / gases from Launch umbilical tower base supply interface to servicing skids and vessels (by others –TBD) at the base to higher elevations of the mobile launcher.

It is envisioned that this potential acquisition may ultimately result in the award of a competitively awarded best value contract.

The intent of this Request for Information (RFI) is to obtain information from industry to assist Kennedy Space Center (KSC) in its acquisition development. NASA reserves the right to share all information received in response to this RFI throughout NASA and to use all information submitted in response to this RFI in NASA's formulation of a solicitation seeking competitive proposals. However, any submitted competition sensitive data should be clearly marked and will not be shared outside of NASA cryogenic pipe spool development team members. Although information contained herein represents current program content and acquisition planning, it is subject to change. Response to this RFI is requested within the context of the general approach described in the following paragraphs.

Cryogenic Pipe Spool Overall Description

Vendor will provide all labor, materials, equipment and delivery services required to produce the design and fabrication deliverables in support of Constellation ground support system liquid Hydrogen (LH2) and Liquid Oxygen (LO2) cryogenic piping segments for the Mobile Launcher Element (MLE):

- Detailed signed PE certified shop drawings and analysis to ASME B31.3 of cryogenic pipe spool segments as described in Table 1 through 3 and isometric images of Appendix A. These shop drawings / analysis based on initial NASA piping segment routing corridors will be provided for Preliminary and Final review cycles for approval by NASA prior to notification to start fabrication. This includes confirmation / review of proposed NASA initial pipe routing, support, type, and design at Preliminary Design Review and Final Review cycles.
- Fabrication, NDE, acceptance tests, cleaning, cryostat, vacuum decay tests, and delivery to KSC site
- There will be three separate awards for the cryogenic piping system, composed of the MLE section basic contract, and the Tilt Up Umbilical Arm (TUUA) section-optional award, and the Cold Helium section –optional award as described in Table 1 through 3 below.

All pipe assembly components shall be designed, fabricated, NDE, and tested per severe cyclic conditions of the ASME Code. B31.3 Pressure Piping Code - Process Piping. The Cryogenic piping inner line will be constructed of 304/316 Stainless Steel (SST) Convolute with 304/316 outer line. Any outer jacket bellows (if utilized) will be constructed of Hastelloy (or other engineering approved highly corrosion resistant material). After bake out at elevated temp and good vacuum established on outer jacket, a chemical gettering system (approved by engineering) will be required. Each section of vacuum jacketed cryogenic pipe spool shall be equipped with an evacuation port and relief valve on the outer jacket. The spool sections in general will be designed / fabricated for field welded closure (later by others). Limited SST Bayonet connections, KC GP-425 approved fitting, and a SST ASME B16.5 Raised Face Concentric Serrated Flange connections are as specified in Table 1-3. The piping sections will also be cryogenic LN2 cold shock tested and precision cleaned in shop before shipment.

The Cryogenic Piping design will be required to meet the general operating ranges as specified in the following fluid performance table. Also shown is the approximate length of piping estimated to be required for the specific application (to allow for ROM cost /delivery time response to this RFI). It is anticipated incremental delivery priority order will be specified in RFP such that 5 to 10 spools will be delivered in staggered increments

Table 1 - MLE Section Piping (Basic Contract)

	Service	Size (NPS)	Design Press	Design Temp	Approx Overall length (ft)	Approx # spools	Start IF	End IF	Supports
<u>MLE</u>									
1	LH ₂	4 x 6	120 psig	36.5 °R	370	11	Pad to ML - ASME Flg	Buttweld in-line	21
2	LH ₂	8 x 10	120 psig	36.5 °R	330	10	Pad to ML - ASME Flg	Buttweld in-line	20
3	LH ₂	6 x 8	120 psig	36.5 °R	420	12	Pad to ML - ASME Flg	Bayonet at IU ML	23
4	LH ₂	3/4 x 1-1/4	120 psig	36.5 °R	10	1	Pad to ML - ASME Flg	Bayonet at IU ML	1
5	LO ₂	4 x 6	300 psig	140 °R	700	13	Pad to ML - ASME Flg	Buttweld in-line	13
6	LO ₂	3/4	300 psig	140 °R	10	1	Buttweld in-line	Bayonet at LO2 TUUA Bulkhead	1

Table 2 - TUUA Section Piping (Optional Award)

	Service	Size (NPS)	Design Press	Design Temp	Approx Overall length (ft)	Approx # spools	Start IF	End IF	Supports
<u>TUUA</u>									
7	LH ₂	4 x 6	45 psig	36.5 °R	18	1	Flexline Bayonett	Flexline Bayonett	5
8	LH ₂	6 x 8	45 psig	36.5 °R	15	1	Flexline Bayonett	Flexline Bayonett	4
9	LH ₂	3/4 x 1-1/4	45 psig	36.5 °R	18	1	KC BLKHD Fitting	KC BLKHD Fitting	2
10	LO ₂	4 x 6	45 psig	140 °R	11	1	Flexline Bayonett	Flexline Bayonett	5
11	GHe	1-1/2 x 3	400 psig	80 °R	36	2	KC BLKHD Fitting	KC BLKHD Fitting	10
12	GHe	1-1/2 x 3	3520 psig	80 °R	18	1	KC BLKHD Fitting	KC BLKHD Fitting	5

Table 3 - Cold Helium Section Piping (Optional Award)

	Service	Size (NPS)	Design Press	Design Temp	Approx Overall length (ft)	Approx # spools	Start IF	End IF	Supports
<u>Cold GHe System</u>									
13	LH ₂	3 x 5	120 psig	36.5 °R	110	3	LH2 Tee Weld In	HEX	10
14	LH ₂	6 x 8	120 psig	36.5 °R	160	5	LH2 Tee Weld In	HEX	16
15	LH ₂	6 x 8	120 psig	36.5 °R	40	2	HEX	Dump Tee Weld In	4
16	GHe	1-1/2 x 3	400 psig	80 °R	200	2	KC BLKHD Fitting	KC BLKHD Fitting	10
17	GHe	1-1/2 x 3	3520 psig	80 °R	50	1	KC BLKHD Fitting	KC BLKHD Fitting	5

SPECIFIC INFORMATION SOLICITED

Responders to this RFI are encouraged to comment on any of the foregoing and to express their interest in this proposed acquisition by submitting the following information:

1. Organization name, address, describe principal activity, primary point of contact and business size.
2. Cost – Rough Order of Magnitude (ROM) for design development, fabrication, acceptance testing, cleaning, packaging, and delivery to KSC.
3. Lead Times – Describe lead times required for design development, and production of hardware.
4. Experience – Describe your experience in developing and producing cryogenic LH2 and LO2 piping for severe cyclic service for ground system cryogenic aerospace and space vehicle /or processing, similar to those as described in this RFI. Please state "past performance" and verifiable references to past projects.

Note: If responders to this RFI would like to propose alternates to such things as; VJ piping concepts (except that inner piping bellows design for expansion will not be considered acceptable), materials of construction, newer technology, etc. they may do so along with accompanying cost and schedule; however, the baseline cost and schedule for the cryogenic piping spools as outlined above shall also be provided with the RFI response.

RESPONSE INSTRUCTIONS

The requested responses are for information and planning purposes only. NASA does not intend to post information or questions received to any website or public access location. NASA does not plan to respond to the individual responses. Feedback to this RFI may be utilized in formulating the Government's acquisition strategy and documents.

All responses should be provided in MS Word document format, both hard and electronic media. Font should be Times New Roman, size 12. Responses should not exceed 15 pages and should reference "RFI-KSC-CRYOPIPE-2009". Please submit responses no later than April 13, 2009, to NASA/KSC Procurement Office, ATTN: Erik Whitehill OP-ES/, Contracting Officer, Kennedy Space Flight Center, FL 32899.

This preliminary information is being made available for planning purposes only, subject to FAR Clause 52.215-3, entitled "Solicitation for Information and Planning Purposes". It does not constitute a Request for Proposal, Invitation for Bid, or Request for Quotation, and it is not to be construed as a commitment by the Government to enter into a contract. Moreover, the Government will not pay for the information submitted in response to this RFI, nor will the Government reimburse an Offeror for costs incurred to prepare responses to this RFI.

No solicitation exists at this time; therefore, do not request a copy of the solicitation. If a solicitation is released it will be synopsized in the FedBizOpps and on the NASA Acquisition Internet Services (NAIS). It is the potential offeror's responsibility to monitor these sites for the release of any solicitation or synopsis.

Appendix A –Conceptual Piping Isometrics

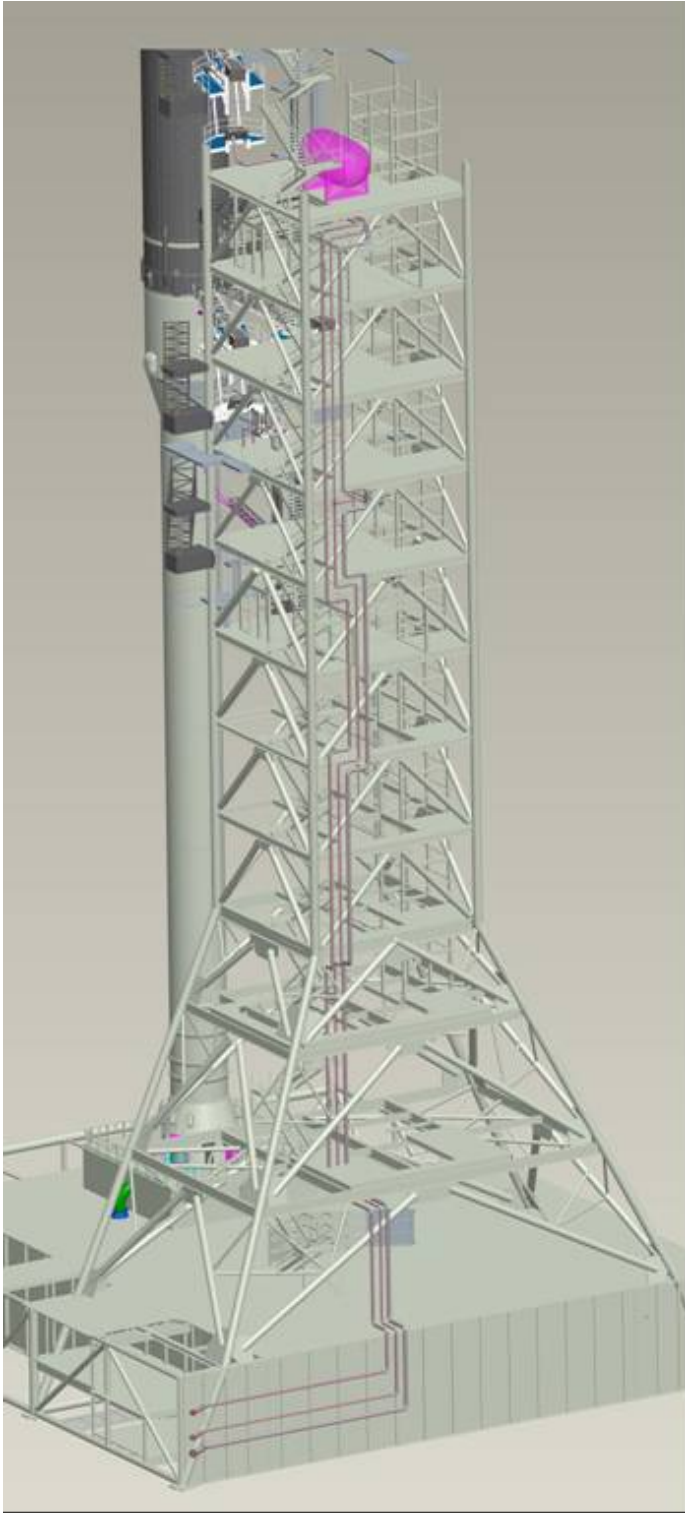


Figure 1- Typical LH2 VJ Pipe Routing

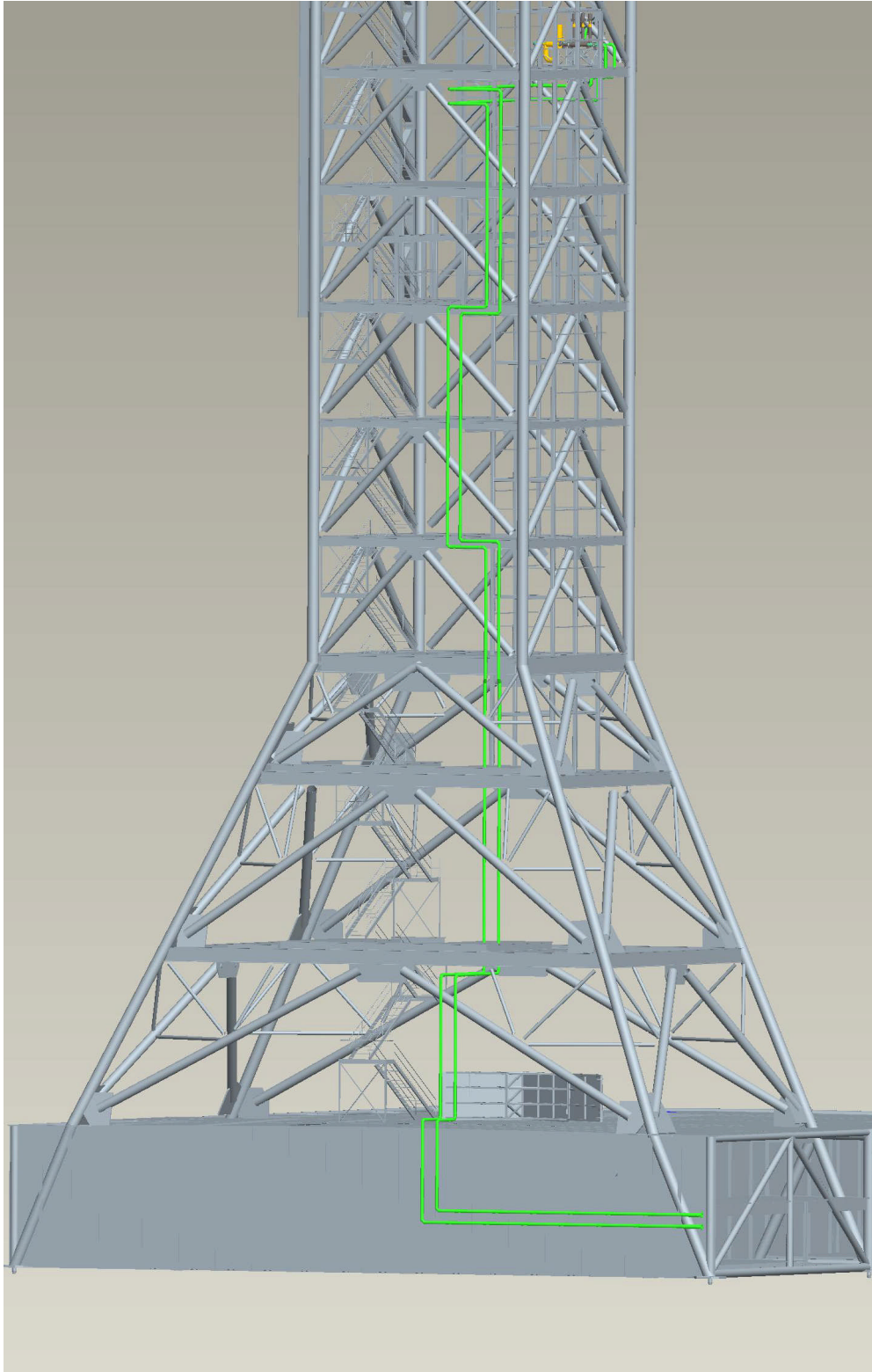


Figure 2- Typical LO2 VJ Pipe Routing